ENERGY AND ENERGY RESOURCE REQUIREMENTS

OF THE

PROVINCE OF ALBERTA

Submitted to

ENERGY RESOURCES CONSERVATION BOARD

with respect to

Proceeding No. 6147

by

IMPERIAL OIL LIMITED

August 1972

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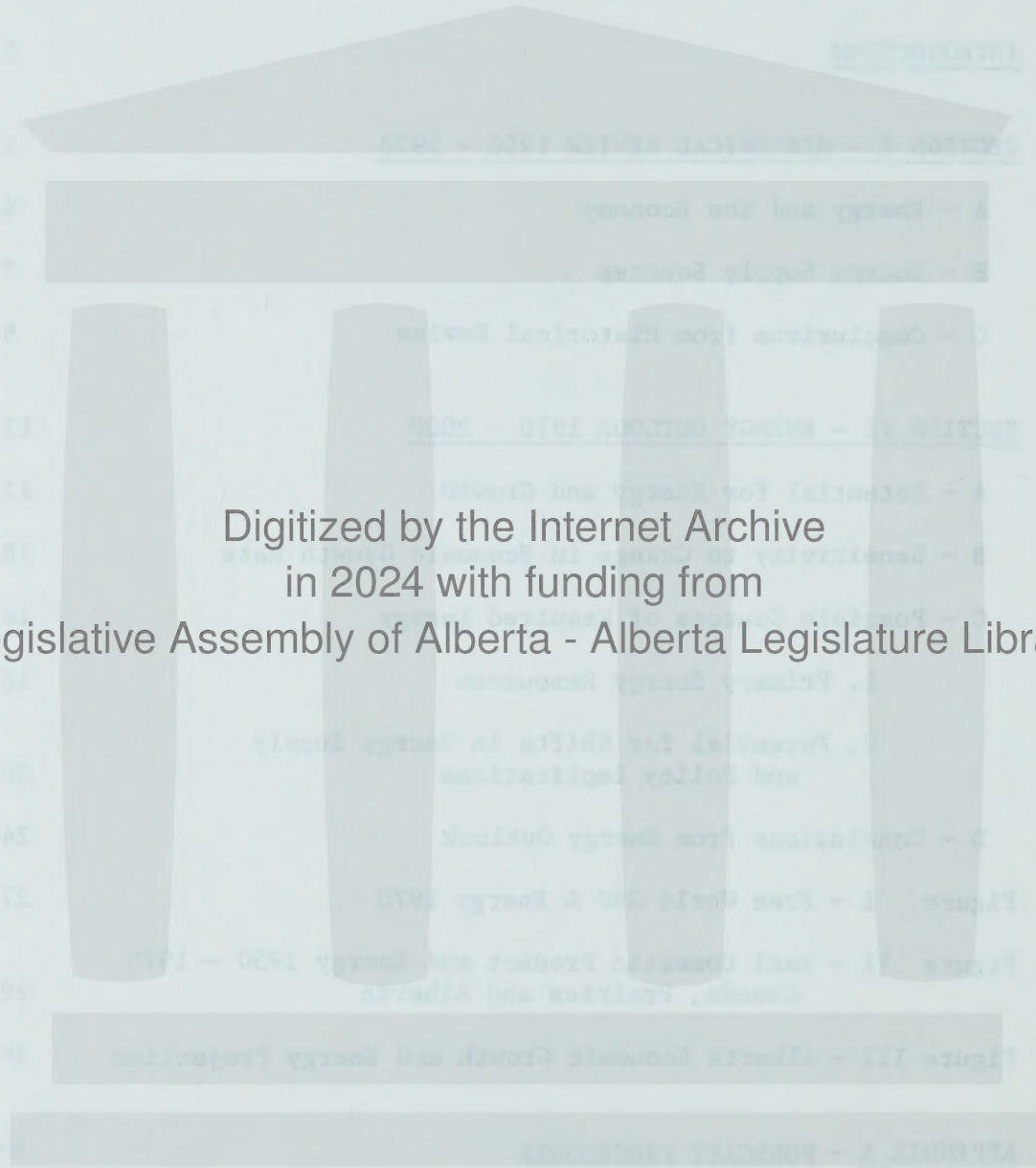


SUBMISSION ON ALBERTA'S ENERGY AND ENERGY RESOURCE REQUIREMENTS

INTRODUCTION

Imperial Oil Limited appreciates the opportunity to make a submission outlining its views on the energy and energy resource requirements of the Province of Alberta. Energy resources have contributed substantially to the vigour of Alberta's economy in the past. This in turn has helped create growth and the need for energy in a broad variety of forms. A better understanding of this interplay for the future is one of the purposes of the present inquiry. Our projections show that, with favourable world and North American economic conditions providing the basis for continuing energy demand, Alberta should continue to prosper.

Our submission is divided into two sections and three appendices. The first section deals with historical background, while the second section summarizes the results of projections on future energy demand and resource requirements to the year 2000. Appendices A and B describe the forecasting methods and projections of the future provincial economy, respectively, while Appendix C contains supporting detail in tables.

As a major supplier operating in the energy field, Imperial Oil Limited periodically assesses the future energy outlook as a basis for its planning activities. Over the years the Company has gained experience with

energy forecasting techniques and correlations between economic factors and demand sectors. These procedures and relationships have been used to generate the projections in this energy outlook.

In order to apply our forecasting procedures and thus bring to bear our experience with them it has been necessary for us to depart somewhat* from the Board's requested forecast format; however, these departures have been minimized.

In making energy demand projections for a period as long as 30 years it should be recognized that the later years in particular are subject to considerable uncertainty. For example, while technological developments will undoubtedly increase the efficiency of energy use they will also generate new uses, provide new energy sources and obsolete others. Changes in social mores can also alter demand, as can government policies, sometimes with unintended results. The net effect of these and many other factors that can cause today's assumptions to change, means that one should look at each numerical projection into the future as one of many possible cases within a spectrum or range which broadens as the forecast period is lengthened.

We have not attempted to quantify the effects of these individual variables in our projections, even though we recognize that they exist. We have chosen rather to prepare a case that reflects Alberta realizing the

* Specifically the residential and commercial sectors have been combined in our forecast, as have industrial and contingency sectors.

economic potential which we believe it possesses and describing it in detail. A general comparison is then made with a case in which some shortfalls in potential are experienced. This method brings out the close linkage between economic well-being and energy use which we consider to be a fundamental relationship. It also serves to caution that the future will not unfold automatically but will hinge on many factors, some of which are within control of the Province.

SECTION I - HISTORICAL REVIEW 1950-1970

A - Energy and the Economy

Energy consumption and the economy of a country, or region are closely related. Figure I (page 27) depicts this for 1970 for a number of countries. The Gross National Product per capita for each nation in terms of 1970 U.S. dollars is plotted versus the energy use per capita expressed in millions of BTU's. The sharp contrast between the industrialized nations of North America, Europe and Japan, and the developing nations of South America and the East is apparent. Per capita income, expressed in constant currency terms, is normally used to measure a nation's standard of living; however, it may well be that energy consumption measured in physical terms is a better gauge. For example, distortions due to differentials in living cost in various parts of the world are reduced.

That use of energy and standard of living in economic terms are so closely related is understandable when one considers that energy can be economically substituted for human efforts thereby releasing man from routine tasks. This permits him to utilize his creative skills to increase his output and in addition to indulge in recreational activities. Additional goods and services are required to meet the needs of this more productive man and the financial rewards of increased productivity are thus available to him and his employer. The result is that new products are developed requiring both additional employment and additional energy supplies for their production.

The additional employment in turn begets or creates further requirements for goods and services perpetuating the cycle.

The improvement in living standards through use of energy is possible because energy is so much cheaper than human effort.

A striking way of presenting this energy bargain starts with a calculation of the energy output of man. Assuming he works at manual labour 8 hours a day for 250 days a year his output is equivalent to around 250,000 BTU per year. In comparison a barrel of crude oil, containing about 6 million BTU, is equivalent to 24 years of manual effort at a cost of about 12 cents per man year equivalent. It is therefore not surprising that in 1970 the average energy consumption for each Albertan was 337 million BTU or the equivalent of a manual work force of about 1,350 people.

Over the years the Canadian standard of living has increased significantly. This is shown on Figure II (page 28) when the per capita Real Domestic Product* for Canada, the Prairies and Alberta is plotted against the energy consumption for the period 1950 to 1970. To the extent that the desire of Canadians to improve their living standard has been achieved, increased energy requirements have occurred.

*Real Domestic Product is a measure of the volume of income generated within the geographic boundaries of a region, exclusive of inflation. It differs from Gross National Product, in that it excludes indirect taxes and the net flow of income to or from non-residents of the region. (Income equals wages, salaries, interest, profits and depreciation). Real Domestic Product will be used in inter-regional comparisons because it more closely reflects the economic activity within a region.

The fossil fuel resources in Alberta provide not only a source of energy for Albertans but also a commodity needed by their neighbours to improve their life. This has meant not only low priced energy for Albertans but also direct and indirect employment to Albertans associated with the production of this commodity.

Tables I and II in the Appendix C show historical economic and energy demand data for Canada, the Prairies and Alberta over the past two decades. The following table summarizes these data and compares energy consumption and Real Domestic Product for Canada, the Prairies and Alberta.

	1950	1970	Annual Growth Rate 1950-1970
ENERGY CONSUMED - Trillions of BTU's			
. Canada	2,559	6,374	4.7%
. Prairies	448	1,028	4.2%
. Alberta	192	538	5.3%
RDP - Billions - 1961 $			
. Canada	21.8	56.1	4.8%
. Prairies	3.77	9.05	4.5%
. Alberta	1.37	4.41	6.1%

In Canada, on an annual average over the past two decades the growth in energy and RDP has been 4.7% and 4.8% respectively, for the Prairies 4.2% and 4.5% and for Alberta 5.3% and 6.1%. Comparable figures for the last 10 years in the United States are 4.3% and 4.5%. In Japan, where output has increased at an annual rate of 10% over the past decade, energy consumption has also increased at an annual rate of 10%.

It is thus again apparent that economic growth and energy consumption go hand-in-hand. It is also noteworthy that the growth rates in both energy consumption and RDP in Alberta exceeded those in the Prairie Region (including Alberta) and in all of Canada.

B - Energy Supply Sources

The table below shows how the contribution of the energy sources that supply the energy demand of these same three geographic areas has changed through time.

	1950			1970		
Source of Energy	Canada	Prairies	Alta.	Canada	Prairies	Alta.
% Share						
Oil	27	33	34	45	38	33
Natural Gas	3	11	25	19	38	53
	30	44	59	64	76	86
Coal	45	44	35	11	12	12
Hydro	20	8	2	24	11	2
Other	5	4	4	1	1	-
TOTAL	100	100	100	100	100	100

From 1950 to 1970 the share of Canada's energy supplied by oil and natural gas increased from 30% to 64%. During this same time Canada's consumption of oil and gas increased fivefold in volume from 777 TrBTU* to 4070 TrBTU. In areas served by Canadian sources of production these growth increases were facilitated by the development of oil and gas resources in Western Canada (particularly Alberta), and by the transportation economies offered by the large oil and gas pipelines which supply both domestic and export demand.

In Alberta the oil and gas share of energy demand increased from 59% to 86% between 1950 and 1970. In volume terms oil and gas consumption increased fourfold from 114 TrBTU to 464 TrBTU. All these changes have been at the expense of coal; however, as will be seen in Table II (Appendix C), in Alberta since 1960 the consumption of coal has been increasing.

Also of interest (see table page 7) is the change in relative share between oil and gas both with time, and with distance from Alberta. In Canada as a whole both oil and gas gained in share but the growth rate in gas was substantially greater than that of oil. This reflects both the introduction of gas to new markets (mainly in Ontario) and its introduction at prices which made it attractive relative to other fuels.

In the Prairies and in Alberta the gas share increased significantly in contrast to relatively little change in the share of oil. This reflects the lower netback in Alberta on gas relative to oil because of the higher transportation cost of gas per unit of energy transported. Although future

* TrBTU = Trillions of British Thermal Units = 10^{12} BTU.

Alberta gas prices will probably increase more than oil prices, this is not likely to change the relative price position of oil and gas in Alberta because of this transportation differential.

The next table compares population and employment.

	1950-1970 Annual Growth Rate	
	Population	Employment
Canada	2.2%	2.4%
Prairies	1.7%	2.2%
Alberta	2.8%	3.5%

At the same time that utilization of energy was improving the economy of Alberta, the production of oil and gas for others was drawing people to the province. The more rapid growth of the population of Alberta than that of all Canada is impressive but compared to the Prairie Region it is outstanding. It was probably the mobile, unattached person migrating to the Province to participate in the job opportunities offered by this youthful industry who was responsible for Alberta's employment growth rate exceeding that of its population.

C - Conclusions from Historical Review

1. Energy consumption and economic activity as measured by real domestic product are closely related.
2. Alberta's per capita energy use is among the highest of that of any region in the world, consistent with its similarly high per capita economic output. This reflects the economic impact

of oil and gas development within the Province and Alberta's emergence as an exporter of oil and natural gas.

3. Oil and gas have gained nearly two-thirds of Canada's energy demand. Major factors have been the availability of supplies in Western Canada and the development of large scale pipeline systems.
4. There has been a substantial shift in sources of energy between oil, natural gas and coal in Alberta and Canada. This has resulted from consumer decisions based on economic factors in markets characterized largely by freedom of choice.
5. Oil and gas have gained an 86% share of Alberta's energy demand but coal is on the up-swing while oil is declining in share. Gas gains share from oil because of its favourable price in Alberta, a result of price in external markets and the lower netback due to the higher unit cost of its transmission.
6. The oil and gas industry has made a major contribution to Alberta's population and employment which have grown at rates significantly higher than those of the rest of Canada.

SECTION II - ENERGY OUTLOOK 1970-2000

Tables III to VIII of Appendix C summarize and provide details of our projection out to the year 2000 of Alberta's energy demand, assuming its economic potential is realized. The energy demands shown in these tables, and discussed and tabulated elsewhere in this submission, generally conform to the Alberta Energy Resources Conservation Board categories and definitions outlined in the Board's Informational Letter No. IL 72-1. Thus energy demand is divided into non-electric and electric categories; energy consumed in the movement of oil and natural gas is contained in the transportation category; energy requirements for gas transportation and reprocessing are restricted to provincial needs and existing gas removal permits; and refinery and gas plant fuel is included in the industrial category. We have chosen to exclude requirements for enhanced recovery projects because we believe they are better treated as supply variables as is the accepted treatment for flared gas and processing shrinkage.

A - Potential for Growth and Energy Demand

In this section of our submission we will summarize parts of the Tables that we believe to be particularly relevant to energy demand.

The next table, taken from data on Table III of Appendix C, provides population estimates and major economic parameters for Alberta upon which our demand projections are based. These are compared to projections for

total Canada, similar to the manner of historical comparisons in Section I. It should be noted however that the numbers for total Canada for the forecast period are closer to the centre of the spectrum of possibilities that we might project, whereas those for Alberta are closer to the upper limit of such a similar spectrum for the Province. Later in the report we consider the overall energy sensitivity of a lower than projected rate of economic growth for the Province.

	1970	1980	1990	2000	Annual Growth Rate 1970-2000
POPULATION - Millions					
. Canada	21.4	25.2	29.8	34.9	1.6%
. Alberta	1.59	1.91	2.28	2.65	1.7%
RDP - Billions - 1961 $					
. Canada	56.1	92.0	133	200	4.3%
. Alberta	4.41	8.26	14.4	27.0	6.2%
INDEX OF INDUSTRIAL PRODUCTION 1961 = 100					
. Canada	170	329	539	993	6.0%
. Alberta	202	426	748	1,585	7.1%

In the above projections the growth rate of Alberta's Real Domestic Product is shown as continuing at the historical percentage rate established from 1950 to 1970. In this historical base period Alberta's growth was largely due to its role as an energy producer and this occurred during a period of world energy surplus. Now we are entering a period when several factors have

combined to create energy shortages in some world markets. In addition there is a growing concern over security of supply. Alberta, and the regions to the North*, thus have the opportunity to satisfy attractive energy market opportunities to the degree that resources can be found and developed and to the degree that meeting this demand is prudent. Alberta's future growth could therefore come from the continued development of Alberta's oil, gas and coal, with increasing emphasis on tar sands and heavy oil, and from the role the Province can play as the logical supply base of men, material and equipment for the future development needs in the North.

A major factor underlying the above projections of economic activity within Alberta is the outlook for energy demand in markets served by Alberta in Canada and the United States. In turn, these markets should be viewed in the context of events in major world demand and supply centres in Western Europe, Japan and the Middle East. The following table, prepared by the Stanford Research Institute, provides a projection of possible demand and supply for Canada, the United States, Western Europe and Japan.

	1970	1980	1990
Millions of Barrels per day of Oil Equivalent.			
Energy Demand	64	110	181
Oil Imports from OPEC**	21	45	74
Oil Imports from OPEC Percent of Energy Demand	33%	41%	41%

* "North" refers to Yukon, Northwest Territories and Arctic Islands.

** Organization of Petroleum Exporting Countries, including Abu Dhabi, Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Qatar, Saudi Arabia, Nigeria, and Venezuela.

The projection indicates a significant and growing dependence by the industrialized nations on OPEC oil as an energy source, particularly during the 1970-1980 period. Western Europe and Japan are today heavily dependent on this supply source.

In the next decade the United States will also become a major world oil importer. The outlook for the United States through 1985 has been summarized by the United States National Petroleum Council (Report of July 1971). In presenting the outlook, the Petroleum Council states that it "is a set of projections, reflecting an optimistic view of what might happen without major changes in present government policies and economic parameters".

To date, there have not been major changes in U.S. Government policies and while such changes may come, with consequent reduction in U.S. energy imports, the basic dimensions of the United States energy problem are well outlined in the following table taken from the NPC report.

	United States Energy Balance	
	1970	1985
Millions of Barrels per day of Oil Equivalent		
Domestic Consumption	32.0	59.0
Domestic Supply	28.1	41.5
Imports required -		
. Oil	3.5	14.6
. Natural Gas	.4	3.0
	3.9	17.6
Imports as % of Consumption	12%	30%

The table shows that by 1985 U.S. energy imports from World sources could be 17.6 million B/D oil equivalent or 30% of all U.S. energy consumption. To put this figure in perspective, total Canadian energy consumption in 1985 is forecast to be 5 million B/D oil equivalent. In this time frame (i.e. through 1985), the major supplement to U.S. domestic energy supply source will be oil imported from OPEC.

In this environment, the market outlook in Canada and the United States for Alberta's energy industries is excellent. The conventional oil and gas industry should continue to enjoy attractive market outlet opportunities. In addition, it is likely that the next couple of decades will see major developments in new sources of energy: for example, synthetic crude production which could perhaps be as much as 1.5 million B/D by 1990.

Given the necessary markets and the appropriate investment climate Alberta's future economic growth could receive additional impetus from developments of the following nature. The decade of the seventies should witness the continued growth, levelling and decline of conventional crude production. Concurrently, with the prospect of higher gas prices, there could be significantly increased effort in the exploration for and development of gas. The mid-seventies to early eighties could see Alberta services and industries supporting exploration, development and pipeline programs for oil and gas in the North. From the eighties to the end of the century a major effort will be required to construct, operate and support from 10 to 20 synthetic crude production plants. All these developments will spur

the growth and evolution of secondary and services industries as have past developments over the last twenty years.

While it is recognized that the future development of Alberta's indigenous energy resources is a matter for Provincial policy, our energy projections are nevertheless based upon Alberta meeting our assessment of its potential economic growth, which includes its role as an energy supplier, as supplier of the secondary support this implies, and as a supplier of secondary support to developments in the North. The energy demand projection to be discussed below, defined in the tables in Appendix C and shown on Figure III (page 29) reflects the demand if this potential is met.

The table below summarizes the demand projections for Alberta.

	1970	1980	1990	2000	Annual Growth Rate 1970-2000
Trillions of BTU					
Non-electric	420	713	1,080	1,868	5.1%
Electric	34	69	129	233	6.6%
	454	782	1,209	2,101	5.2%
Conversion Losses*	84	136	240	422	5.5%
Total Energy Resource Demand	538	918	1,449	2,523	5.3%

As shown above, we project that Alberta's total non-electric energy demand has the potential to increase from 421 TrBTU in 1970 to 1868 TrBTU in the year 2000, an average annual growth rate of 5.1%. Electrical demand increases more rapidly in this projection, from 34 TrBTU in 1970 to 233 TrBTU

* Hydro included on input basis of 10,000 BTU/KWH.

in 2000, an average annual growth rate of 6.6%. The growth rate in total energy demand averages 5.3% per annum over the 30 year period.

The table below, calculated from data in Tables IV and V, Appendix C, summarizes the share of energy demand for the major market sectors (including electric energy) in Alberta in this same period.

	% Share of Total Sector Demand	
	1970	2000
Residential/Commercial	29	29
Transportation	24	14
Industrial	27	39
Conversion and Other Losses*	20	18
	100	100

The residential/commercial sector, which now accounts for 29% of total energy demand, maintains its share through the forecast period.

Transportation which now consumes 24% of Alberta energy demand declines to 14% by 2000. While this appears to be a dramatic change, reference to Table IV Appendix C shows that oil demand for transportation increases from 118 TrBTU in 1970 to 325 TrBTU in 2000, an annual growth rate of 3.4% compared to an effective growth rate of 4.5% since 1950. Motor vehicles consume the major share of transportation demand and energy use in this sector is closely related to population and vehicles per capita. We expect that growth in both these factors will be lower in the future than it was in the past.

* Hydro included on input basis of 10,000 BTU/KWH.

The industrial demand which now accounts for 27% of demand grows to 39% by 2000. This level of demand corresponds to an average annual growth rate of 6.6%.

B - Sensitivity to Change in Economic Growth Rate

It is recognized that the total Alberta energy demand of about 2500 TrBTU will be achieved only if the many projected future developments discussed earlier occur during the forecast period. Accordingly we have investigated the sensitivity of our forecast to a Provincial RDP growth rate lower by 1% per annum. This results in an average annual growth rate halfway between those shown on Page 12 for Alberta (at 6.2%) and for total Canada (at 4.3%). This sensitivity is shown also on Figure III (page 29) and results in a year 2000 demand lower by about 550 TrBTU, or 22% less than that for the terminal year of the potential case. It is therefore an indication of the effect of events or policies which could inhibit Alberta's growth towards its potential and which in turn would reduce the Province's energy demand.

C - Possible Sources of Required Energy

1. Primary Energy Resources

The table on the following page shows the primary energy supply by fuel source for Alberta. The underlying data are contained in Table VI of Appendix C.

	Share of Alberta Energy Demand		
	1970	Percent	2000
Oil	33		19
Natural Gas	53		54
Coal	12		26
Hydro	2		1
	100		100

Natural gas supplies the major share of Alberta's energy demand with the exception of two demand sectors: transportation, which is dominated by oil, and electrical generation where coal is a major and growing supply source.

The projection assumes a continuation within Alberta of the historic interfuel pricing order among the fossil fuels. That is on a BTU basis coal is expected to continue to be the least costly, natural gas somewhat more expensive and crude oil the most costly. Nevertheless the price differential between natural gas and oil is expected to narrow. Electricity derived from available hydro sites or nuclear plants is expected to be more costly than that derived from thermal generation using coal.

The competitive position of these fuels in Alberta derives from energy pricing in Canada and North America which today is generally based on the price of each fuel source in its marginal (i.e., furthest from the supply source) market.

The price at origin then reflects these market prices less the cost of transportation. Again on the basis of the equivalent BTU's delivered to the Ontario or U.S. mid-West markets, oil is the least costly to transport, natural gas is next with costs approximately three times those of oil, while coal follows with costs double those for natural gas.

As new supply sources supplement or replace present ones, and new transportation and other technology becomes available, different interfuel pricing relationships for the various energy forms could emerge and these could result in different supply configurations for Alberta. For example, the relative contribution of nuclear generated electricity could increase if there were a break-through in the cost of producing heavy water. Other possibilities will be discussed in the next part of this section.

2. Potential for Shifts in Energy Supply and Policy Implications

We discussed above the supply pattern that will probably result from projections based on present technology and expected price trends. However, because of worldwide and North American energy demand pressures, costs and prices of energy are likely to rise and thus there will be substantial technical innovation in the energy field which could affect supply patterns.

In the next couple of decades, technical effort will focus on developing more efficient uses of energy, the further development of synthetic oil and gas, new and more acceptable uses for coal, the first generation of nuclear plants, and the development of a second generation using breeder technology. Also, there will probably be a substantial improvement in the thermal-electric cycle. By the end of the century nuclear fusion may be a reality for electrical generation and entirely new sources such as solar energy may begin to contribute.

Thus, while fossil fuels today enjoy a ready market, there are international political and economic pressures to find alternate energy systems which would substantially change current interfuel economic relationships. In other words, Alberta's external markets are subject to the hazard of substitution. Therefore, if Alberta chooses to capitalize on its potential as an energy supplier, it must do so not only in time to meet the expected domestic and international demand, but also without inhibiting development by some factor that may have unintended consequences.

For example, one inhibiting factor would be the imposition of a disproportionate tax burden on the industrial sector responsible for the attainment of the Province's economic growth potential. In fact such a course of action could have an inhibiting influence on the necessary favourable investment climate required to achieve the benefits of the potential case.

Another factor affecting future supply patterns is that we can expect increased conversion among energy forms. Technology exists today to convert coal to synthetic gas; it is likely that systems for burning coal directly in industrial use that are acceptable within environmental policy will be available within the next decade. Technology is now available to convert tar sands to crude oil and this industry may provide as a by-product, a new fuel source that could be used in the generation of electricity. There is potential for substantial further hydro-electric development in the more remote areas of Alberta. Although appearing high cost today, the combination of new technology and higher costs for competing energy forms could make the development of these hydro resources attractive before the end of the century.

Provided users continue to have the freedom of choice among competing energy forms, the emergence and availability of new energy sources will in time alter the share which tradional energy sources supply.

The prospects of emerging technologies that offer the promise of both new energy supply patterns and greater ease of energy interchangeability also pose a challenge to policy makers to ensure that such prospects are best exploited. It would be prudent to re-examine periodically any policies that interfere with the free flow of goods in our market oriented economy. Too much interference will inevitably result in an inhibition of Alberta's economic growth potential.

Another factor influencing supply shifts involves the implications of environmental conservation. For example, Alberta is fortunate in having supplies of low sulphur coal, the most economically attractive being that which can be mined using surface recovery techniques. Its use will provide energy at the lowest cost to Alberta's economy, as well as the prospect of future exports, providing a reasonable balance can be maintained on matters such as the real and apparent need for environmental protection and the preservation of the wilderness. Similar issues arise in the location and operation of pipelines, gas processing plants, and synthetic crude plants. Problems associated with these issues can be reduced or eliminated but only at some added cost. It is important that government and industry cooperate in setting environmental standards and assessment procedures that provide for reasonable and attainable goals, in ways that do not dislocate continuity of supply, and which minimize increases in cost. Further, care must be taken to ensure that short-run environmental considerations do not result in decisions which might have harmful long term impact.

In summary, although we have shown a particular supply balance, it is probable that increasing interchangeability of basic energy raw materials will result in shifts in energy use patterns within Alberta by the end of the century. The nature of these developments is impossible to foresee at this time, but they will evolve with greatest benefit to the Province if brought about through the price mechanism operating in a free, competitive market environment.

D - Conclusions from Energy Outlook

(1) Energy is indispensable to improving living standards and its use will increase in proportion to the level of economic activity. If such economic gains are to equal those of the recent past, energy demand in Alberta must increase almost fivefold by the end of the century.

(2) Natural gas, oil and coal supply 98% of the energy requirements of Alberta today. While some shifts in share can be expected these fossil fuels will continue to provide virtually all of the future needs of the Province over the next three decades. Alberta is fortunate in having abundant supplies of all three energy sources today and has a variety of options to supply future demand.

(3) Energy prices can be expected to increase because of supply shortages and security concerns. This will give strong impetus to the development of technology to enhance the world's energy supplies - through better utilization of known energy resources; through the search for new, remote and costly supplies of conventional fuels; and through the development of entirely new sources of energy. Even at much higher cost energy will be relatively inexpensive in relation to the benefits it can provide to society.

(4) Currently a major source of energy to other parts of Canada and an important supplier to the United States, Alberta can, if it chooses, take steps to maintain and enhance this position to the benefit of

its economy; however, to do so will require:

i. Continuing capital inputs at a high level. The magnitude of these inputs and their realization will require a favourable investment climate. As a corollary, it follows that Alberta must have access to major markets in both Canada and the United States to ensure minimal investment risk. To bring forth new supplies will require long lead-times and the necessary investment will not be forthcoming unless access to future markets is assured.

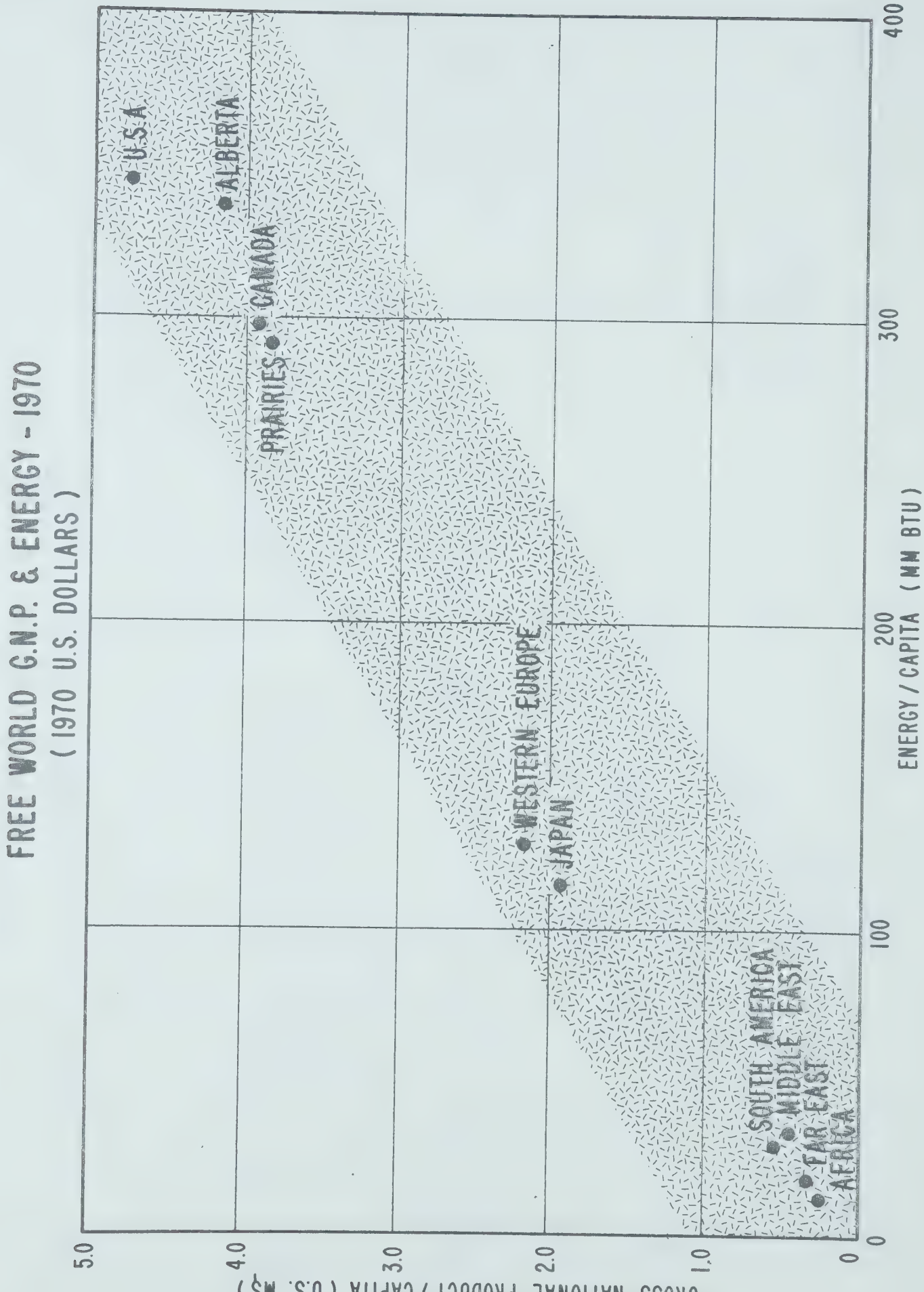
ii. New technology and a climate in which its commercialization can be accomplished. For example, improved technology will assist in making the development of heavy hydrocarbons and coal attractive, and its incorporation at the early stages of a new energy supply cycle will help Alberta's energy resources meet long term competition.

iii. The encouragement of the maximum degree of participation by, and competition among, energy developers so as to broaden as much as possible the risk, capital and technological base.

iv. Cooperation between government and industry in setting environmental standards and assessment procedures that provide for reasonable and attainable goals.

(5) The Province will achieve optimum economic growth, to levels determined in part by its energy policy, by encouraging free competition within the framework of sound government regulations. Alberta's energy policy will presumably take into account factors of national concern, such as security of supply; the legitimate aspirations of the other regions of Canada, which relate to the welfare of the entire country; and in addition, reflect the effect of U.S. energy policies on market opportunities. Due consideration should be given to the possibilities for energy interchangeability and the prospect for new forms of energy and energy systems, with price as the natural market mechanism for the efficient allocation of commodities that are interchangeable.

FIGURE I


FREE WORLD G.N.P. & ENERGY - 1970
(1970 U.S. DOLLARS)
GROSS NATIONAL PRODUCT / CAPITA (U.S. M$)
ENERGY / CAPITA (MM BTU)
5.0
4.0
3.0
2.0
1.0
0
100
200
300
400
U.S.A.
ALBERTA
CANADA
PRAIRIES
WESTERN EUROPE
JAPAN
SOUTH AMERICA
MIDDLE EAST
FAR EAST
AFRICA

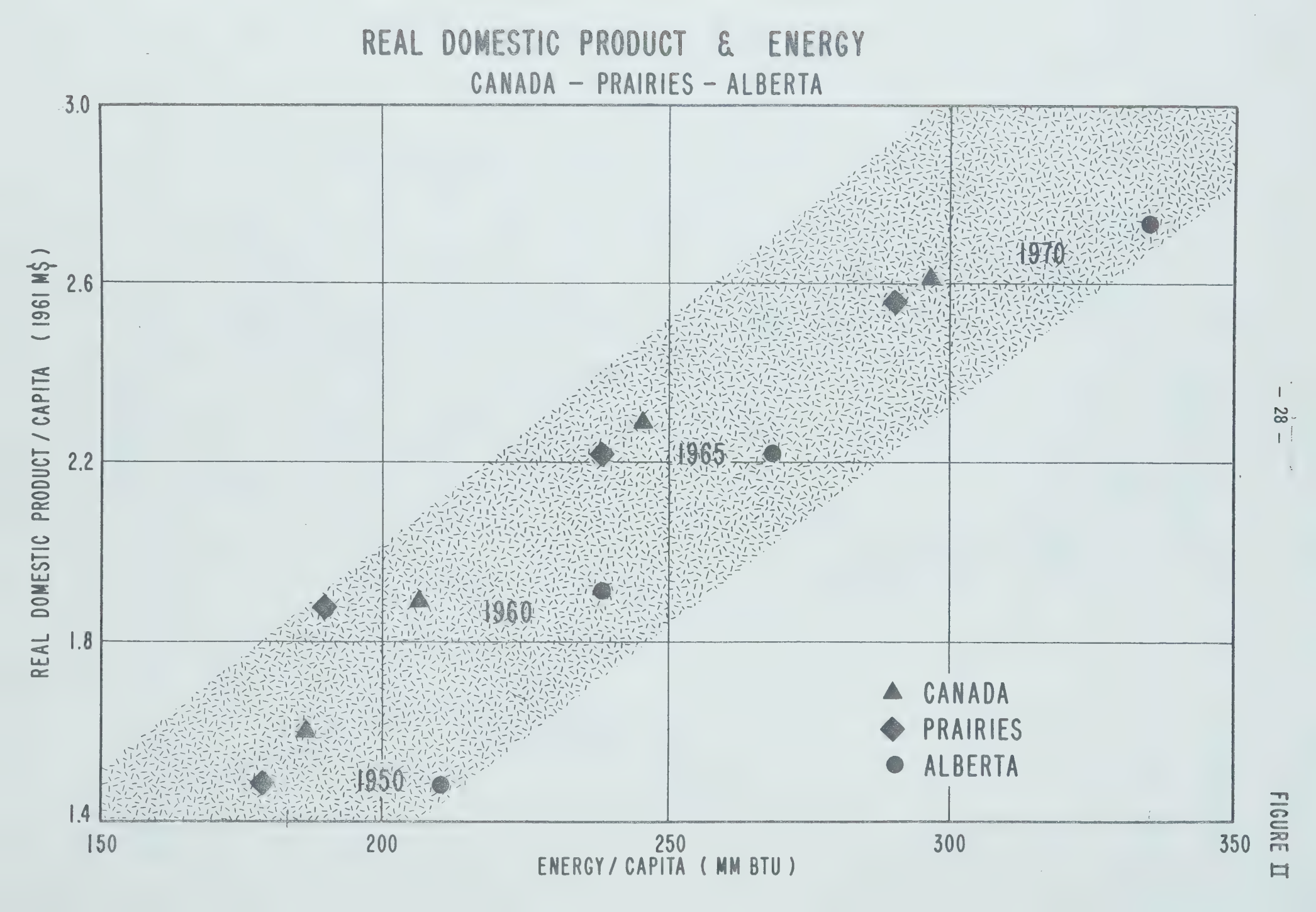
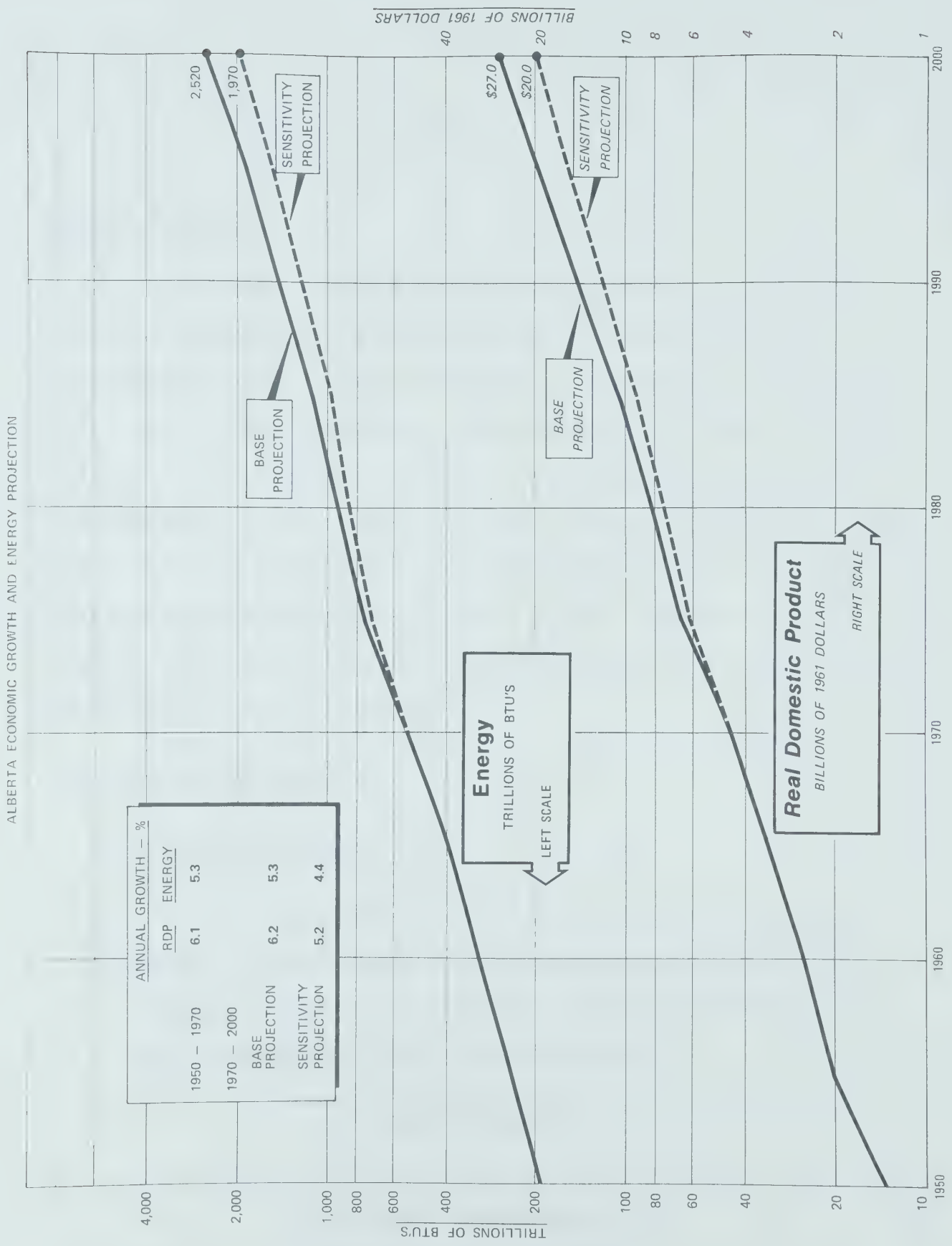

REAL DOMESTIC PRODUCT & ENERGY
CANADA – PRAIRIES – ALBERTA
REAL DOMESTIC PRODUCT / CAPITA (1961 M$)
3.0
2.6
2.2
1.8
1.4
150
200
250
300
350
ENERGY / CAPITA (MM BTU)
1950
1960
1965
1970
CANADA
PRAIRIES
ALBERTA

FIGURE II

FIGURE III


ALBERTA ECONOMIC GROWTH AND ENERGY PROJECTION
BILLIONS OF 1961 DOLLARS
TRILLIONS OF BTU'S
2,520
1,970
$27.0
$20.0
SENSITIVITY PROJECTION
BASE PROJECTION
Energy
TRILLIONS OF BTU'S
LEFT SCALE
Real Domestic Product
BILLIONS OF 1961 DOLLARS
RIGHT SCALE
ANNUAL GROWTH — %
RDP ENERGY
1950 — 1970 6.1 5.3
1970 — 2000
BASE PROJECTION 6.2 5.3
SENSITIVITY PROJECTION 5.2 4.4
4,000
2,000
1,000
800
600
400
200
100
80
60
40
20
10
40
20
10
8
6
4
2
1
1950
1960
1970
1980
1990
2000

APPENDIX A

FORECAST PROCEDURES

The primary procedure used for the projections in this study involved the regression of historical energy consumption over twenty years against economic correlating variables. The criterion for "goodness of fit" was a minimum correlation coefficient of $r^2 = 0.97$, plus a subjective evaluation of the 'reasonableness' of the trend over the forecast period. This technique requires a projection of the economic correlating variables. This is discussed in Appendix B, while the economic historic growth rates and projected indices are shown in Tables IX and X, Appendix C. Other techniques were used to allocate demand among energy sources and to forecast certain specific demand components.

A - Non-Electric Energy

1. Residential/Commercial

Total residential/commercial energy use was regressed against a linear function of total population and the Services component of Real Domestic Product. The forecast energy demand was allocated among energy sources as follows:

- Gas was forecast to take up essentially all the the future growth.
- Coal was declined to nominal level.
- Oil supplied the difference.

Propane uses are included in the oil sector.

2. Transportation

(i) Motive Power

Total motive power energy use, adjusted on a fuel efficiency basis, was regressed against a linear combination of Real Domestic Product and the population segment between the ages of 20 - 69.

(ii) Oil Pipeline Fuel/Loss

These requirements were estimated from forecasts of conventional crude production, both indigenous to and passing through the Province, product movement, and synthetic crude production.

(iii) Gas Pipeline Fuel/Loss

These requirements were estimated from forecasts of future Alberta gas demands and the current permit-related gas requirements. No allowance was made for the transmission of frontier gas through the Province because the ultimate location of the line is currently uncertain.

3. Industrial

Total non-electric industrial energy consumption was regressed against the Goods Producing index (excluding agriculture).

The resulting industrial energy demand was allocated among energy sources as follows:

- Gas was forecast to take up the major share of future growth.
- Coal was allocated a limited share of the industrial fuel growth.
- Oil retains volumetric level.

The refinery fuel forecast assumes that Alberta-based refineries supply a major share of the future Prairie energy and non-energy requirements.

The petrochemical requirement is assumed to stay constant at today's level, while existing fertilizer plants are assumed to reach capacity by 1975.

The natural gas volumes required for synthetic crude production and included in our industrial category, are as follows:

	1972	1975	1977	1980	1985	1990	2000
Natural Gas Requirement (Bcf)	6	10	19	42	42	24	0
Synthetic Crude Production Level (MBCD)	50	75	125	300	<700	<1,500	<3,500

It should be recognized that future synthetic crude production could vary over a wide range, particularly after 1980, reflecting factors such as future royalties, energy prices, the availability of risk capital in the light of the prevailing investment climate, and the ability of technology to overcome future cost escalation through increasing the productivity of capital. This will not significantly affect our forecast requirement for external gas supply, because we anticipate that synthetic crude

plants coming on stream after 1980 will produce their own supply and that, after 1985, older plants will similarly start reducing their demand on external gas supply.

B - Electric Energy

1. Residential/Commercial

Total residential/commercial electrical energy use was regressed against the Services component of Alberta's RDP.

2. Transportation

The Canadian Petroleum Association forecast of oil-gathering pipeline electric power was used to supply this portion of transportation demand.

The electric power requirements for oil transmission lines were estimated from the oil throughput forecast discussed earlier in this Appendix Section A. 2 (ii).

No electric requirement is forecast for gas transmission.

3. Industrial

Total industrial electrical energy use was regressed against the Index of Alberta's Industrial Production. The historical data did not contain the remaining end use categories listed below, which were forecast independently and are included in the industrial sector on Table V, Appendix C.

Gas Processing and Reprocessing

The basis for this forecast was obtained from the Canadian Petroleum Association and adjusted upwards to reflect our forecast of Alberta's natural gas requirements.

Oil Field Use

This forecast was obtained from the Canadian Petroleum Association.

Refinery

This forecast assumes that Alberta-based refineries supply a major share of the future Prairie energy and non-energy requirements.

4. Transmission Losses

These were projected at approximately 12% of the total residential/commercial, transportation and industrial electrical demand.

5. Electricity Generation Fuel Source

- Hydro electric development was assumed to remain at current levels.
- Natural gas as fuel for thermal generation was assumed to supply and fill out existing plants, and then to decline as these plants become obsolete.

- Coal as a fuel for thermal generation was assumed to supply the balance of electrical demand.

C - Sensitivity to the Potential Projection

To evaluate the effect on energy demand of a lower level of economic growth, the growth rate of each of the 11 individual components comprising the projection of Alberta's Real Domestic Product was changed by an appropriate constant annual percentage. The output values calculated with these new growth rates were summed to produce new values of the regression variables used in the base case projection, i.e. Services, Goods less Agriculture, and Industrial Production. The regression calculations were repeated and the sensitivity projection constructed.

APPENDIX B

ECONOMIC PARAMETERS BASIC TO ENERGY FORECAST

1. Historical Real Domestic Product

The basis for the forecasting procedures used in the study is the correlation of historical energy demand with economic parameters. This required the development of both historical and future estimates of Alberta's Real Domestic Product and, of course, its components. This historical growth rate of these indices is shown in Table IX, Appendix C. The projection used combinations of components of the RDP and these are defined and quantified on the same Table.

The table reveals that total output as measured by RDP grew at an average rate of 6.1% since 1949. This compares to 4.5% for the Prairies and 4.8% for Canada as a whole. The rapid-growth industries are mining (especially mineral fuels), manufacturing, utilities, and two service type industries: trade, and community and business services. The rapid growth in mineral fuels encouraged population growth which, along with the direct demands by the mineral fuels industry, stimulated manufacturing and utilities. The service activities provided additional impetus to growth and construction also made an important contribution. Agriculture has grown slowly throughout the period, and declined from 18% of RDP in 1949 to 8.3% in 1970.

2. Forecast of Real Domestic Product

Table X, Appendix C shows a projection of relative value and growth rates of the Alberta Real Domestic Product and of the indicated industry groups. The relative value of each industry group was obtained by projecting each component of Real Domestic Product to the year 2000 and appropriately combining them.

The growth rate of RDP and the index of most industry groups between 1970 and 1975 will exceed the historical rate primarily due to the substantial growth in the output of mineral fuels. In addition the year 1970 was a relatively poor year in both Alberta and Canada and some catching up occurs.

For the next ten years (1975 - 1980 and 1980 - 1985) growth is projected to level out, with RDP advancing about 5% per annum. This quite respectable rate of increase is sustained by the service and construction sectors of the economy. The service sector growth is dependent upon both general business conditions and population expansion. There is a close correlation between rising population and development of the service sector. As will be seen below the population growth for Alberta will be substantial between 1975 and 1985. Strong and steady growth should occur during the 1986 - 2000 period, similar to that experienced in Alberta in the two decades 1950 - 1970.

3. Forecast of Population

The Alberta Energy Resources Conservation Board forecast is compared with the Imperial forecast in the table below:

ALTERNATE FORECASTS OF ALBERTA POPULATION 1971-2000

	1961	1966	1971	1975	1980	1985	1990	1995	2000
(1) AERCB	1,332	1,463	1,619e	1,747	1,924	2,115	2,306	2,490	2,672
(2) I.O.L. 1971 (e) estimate	1,332	1,463	1,628	1,751	1,914	2,093	2,277	2,463	2,654

The population forecast "I.O.L. 1971" is based on the census population count for 1971 and utilizes our own assumptions as to birth, deaths and net migration rates.

The next table expresses the forecast values as annual percentage change.

	1971/61	75/71	80/75	85/80	90/85	95/90	2000/95
AERCB Alberta	2.0	1.9	2.0	1.9	1.8	1.6	1.4
I.O.L. '71 Alberta	2.0	1.8	1.8	1.8	1.7	1.6	1.5
I.O.L. '71 Canada	1.7	1.4	1.4	1.4	1.3	1.1	1.0

Both forecasts for Alberta portray similar patterns out to the year 2000 and are higher than the national outlook.

The age structure in Alberta is such that the implied growth in labour force should be quite slow in comparison to historical standards. For Alberta to obtain the projected rates of growth in output, the output per employed person will have to grow at a rate significantly above historical patterns or there will need to be increased migration into the Province. Failure of either of these to materialize would mean that Alberta's RDP by the year 2000 would approximate our sensitivity projection illustrated on Figure III (page 29).

APPENDIX C

TABLES

TABLE I

HISTORICAL DATA

	1950	1960	1965	1970	Annual Growth 1950/1970 %
RDP (Million $ 1961)					
Canada	21,819	34,267	45,107	56,086	4.8
Prairies	3,774	5,932	7,577	9,052	4.5
Alberta	1,367	2,504	3,387	4,412	6.1
Index of Industrial Production (1961 = 100)					
Canada	57.3	96.2	137.0	170.4	5.6
Prairies	42.2	92.2	141.0	202.5	8.2
Alberta	34.9	91.7	140.5	201.5	9.2
Population (Thousands)					
Canada	13,712	17,870	19,644	21,377	2.2
Prairies	2,514	3,134	3,392	3,552	1.7
Alberta	913	1,291	1,450	1,595	2.8
Total Energy (1) (Trillion BTU's)					
Canada (2)	2,559	3,701	4,839	6,374	4.7
Prairies	448	591	802	1,028	4.2
Alberta	192	308	390	538	5.3
Energy Per Capita (Million BTU's/Capita)					
Canada	187	207	246	298	2.4
Prairies	178	189	236	289	2.4
Alberta	210	239	269	337	2.4
RDP Per Capita (1961 $/Capita)					
Canada	1,591	1,918	2,296	2,624	2.5
Prairies	1,501	1,893	2,234	2,548	2.7
Alberta	1,497	1,940	2,336	2,766	3.1

(1) Hydro on input basis equivalent of 10,000 BTU/KWH.

(2) Includes gas processing plant fuel and losses which, by ERCB definition, have been excluded from Alberta and Prairies Energy figures shown.

TABLE II

ALBERTA
ENERGY SUPPLY/DEMAND
Trillions of BTU

	1950	1960	1965	1970
SUPPLY				
Oil	65.5	126.5	142.2	179.3
Natural Gas	48.1	145.8	198.8	283.6
Coal	67.9	22.9	33.2	62.2
Hydro (1)	3.5	10.2	14.1	12.3
Wood	7.0	3.0	2.0	1.0
TOTAL SUPPLY	192.0	308.4	390.3	538.4
DEMAND				
Residential/Commercial				
Oil	2.1	14.6	15.6	22.2
Natural Gas	28.7	64.6	85.7	113.4
Coal	22.7	14.4	9.3	6.6
Electricity	1.0	4.4	8.3	13.7
Wood	7.0	3.0	2.0	1.0
TOTAL	61.5	101.0	120.9	156.9
Transportation				
Oil	52.3	81.7	90.2	118.1
Gas	-	*	9.1	12.0
Electricity	-	.1	.4	1.0
Coal	22.5	-	-	-
TOTAL	74.8	81.8	99.7	131.1
Industrial				
Oil	9.5	22.3	21.8	28.1
Natural Gas	13.6	48.7	70.8	100.4
Coal	5.3	.7	.4	2.8
Electricity	1.7	5.9	8.5	14.8
TOTAL	30.1	77.6	101.5	146.1
Losses (2)	14.2	12.9	16.8	19.9
Electricity Input				
Oil	.2	.3	.8	2.7
Natural Gas	5.8	32.5	33.2	50.2
Coal	5.0	3.9	22.4	52.7
Hydro (1)	3.5	10.2	14.1	12.3
Total Input	14.5	46.9	70.5	117.9
Less: Electricity Used	(3.1)	(11.8)	(19.1)	(33.5)
Thermal Loss	11.4	35.1	51.4	84.4
TOTAL DEMAND	192.0	308.4	390.3	538.4

* Less than .05 Tr. BTU's.
(1) Input Basis Equivalent of 10,000 BTU/KWH
(2) Includes Transmission, Refinery & Oil Field Losses

PROJECTION DATA *

	1970	1980	1990	2000	Annual Growth 1970-2000 %
RDP (Million $ 1961)					
Canada	56,086	92,000	133,700	200,000	4.3
Alberta	4,412	8,260	14,350	26,980	6.2
Index of Industrial Production (1961 = 100)					
Canada	170.4	329.2	538.8	993.4	6.0
Alberta	201.5	425.7	747.7	1585.3	7.1
Population (Thousands)					
Canada	21,377	25,200	29,800	34,900	1.6
Alberta	1,595	1,914	2,277	2,654	1.7
Total Energy (1) (Trillion BTU's)					
Canada (2)	6,374	10,400	15,900	23,770	4.5
Alberta	538	918	1,449	2,523	5.3
Energy Per Capita (Million BTU's/Capita)					
Canada	298	413	534	681	2.8
Alberta	337	480	636	951	3.5
RDP Per Capita (1961 $/Capita)					
Canada	2,624	3,650	4,487	5,731	2.6
Alberta	2,766	4,315	6,300	10,160	4.4

* In considering the energy demand derivations shown on this and subsequent tables attention is drawn to the explanatory comments beginning on page 11 (under the heading Potential for Growth and Energy Demand) with respect to the comparative basis for projections for Alberta and for total Canada.

(1) Hydro on input basis equivalent of 10,000 BTU/KWH.

(2) Includes allowance for fuel consumption and losses associated with production and deliveries of energy supplies from all sources and not limited to existing Alberta removal permits.

TABLE IV

ALBERTA
NON ELECTRIC ENERGY
Trillions of BTU

	1970	1975	1980	1985	1990	1995	2000
RESIDENTIAL/ COMMERCIAL							
Oil	22.2	25.6	30.0	32.5	34.5	39.5	44.7
Gas	113.4	153.7	197.8	258.6	342.6	445.9	581.0
Coal	6.6	3.0	2.0	1.0	1.0	1.0	1.0
Wood	1.0	-	-	-	-	-	-
Total	143.2	182.3	229.8	292.1	378.1	486.4	626.7
TRANSPORTATION							
Oil	118.1	140.5	154.2	177.3	209.5	259.7	324.7
Gas	12.0	24.5	24.5	23.0	18.0	8.0	10.0
Total	130.1	165.0	178.7	200.3	227.5	267.7	334.7
INDUSTRIAL							
Oil	28.1	48.3	55.2	61.9	70.8	83.2	98.8
Gas	100.4	150.1	221.7	269.3	377.9	526.4	754.1
Coal	2.8	4.4	6.0	9.2	13.4	26.7	42.0
Total	131.3	202.8	282.9	340.4	462.1	636.3	894.9
LOSSES	15.9	22.9	21.2	19.0	11.9	10.3	11.6
TOTAL FUELS							
Oil	176.6	227.3	250.6	281.7	322.7	390.7	476.8
Gas	233.4	338.3	454.0	559.9	742.5	982.3	1348.1
Coal	9.5	7.4	8.0	10.2	14.4	27.7	43.0
Wood	1.0	-	-	-	-	-	-
Total	420.5	573.0	712.6	851.8	1079.6	1400.7	1867.9

ALBERTA
ELECTRIC ENERGY
Trillions of BTU

	1970	1975	1980	1985	1990	1995	2000
DEMAND							
RESIDENTIAL/ COMMERCIAL	13.7	19.7	28.2	39.7	55.2	76.0	104.1
TRANSPORTATION (1)	1.0	4.7	4.5	9.0	15.9	15.0	16.8
INDUSTRIAL	14.8	24.5	28.7	32.6	44.1	62.4	87.1
LOSSES	4.0	5.9	7.5	9.8	14.1	18.6	25.3
TOTAL	33.5	54.8	68.9	91.1	129.3	172.0	233.3
SUPPLY							
Oil	2.7	3.0	3.0	3.0	-	-	-
Gas*	50.2	61.4	73.8	60.6	54.2	31.7	24.9
Coal	52.7	95.7	116.3	184.9	302.8	442.3	617.5
Hydro (2)	12.3	12.3	12.3	12.3	12.3	12.3	12.3
TOTAL	117.9	172.4	205.4	260.8	369.3	486.3	654.7
* Includes Fuel for Industrial Electric Generation	7.4	7.6	7.8	8.4	8.9	9.4	9.9

(1) Comprises only power for crude oil gathering and synthetic crude, product and trunk line oil transportation.
(2) Input Basis Equivalent of 10,000 BTU/KWH.

ALBERTA
TOTAL FUEL SUPPLY
Trillions of BTU

	1970	1975	1980	1985	1990	1995	2000
Oil	179.3	230.3	253.6	284.7	322.7	390.7	476.8
Gas	283.6	399.7	527.8	620.5	796.7	1014.0	1373.0
Coal	62.2	103.1	124.3	195.1	317.2	470.0	660.5
Wood	1.0	-	-	-	-	-	-
Hydro	12.3	12.3	12.3	12.3	12.3	12.3	12.3
TOTAL	538.4	745.4	918.0	1112.6	1448.9	1887.0	2522.6

TABLE VII

ALBERTA
COMPONENTS OF SELECTED DATA FROM TABLES IV & V
Trillions of BTU

		1970	1975	1980	1985	1990	1995	2000
TRANSPORTATION								
Electric Power:								
Oil Pipelines	(1)	1.0	4.7	4.5	9.0	15.9	15.0	16.8
Non-Electric Fuels:								
Oil Pipelines (Oil)	(2)	3.4	5.5	2.3	2.6	2.9	2.8	3.3
Gas Trunk Line (Gas)	(3)	12.0	24.5	24.5	23.0	18.0	8.0	10.0
INDUSTRIAL								
Refinery Fuel (Oil)		14.3	34.3	40.2	46.9	55.8	68.2	83.8
Reprocessing Plant Fuel (Gas)	(4)							
Alberta		2.3	2.3	2.3	2.3	2.3	2.3	2.3
Ex-province	(5)	12.3	17.3	17.4	15.7	11.0	-	-
Alberta Distributors (Gas)		2.5	4.1	5.0	6.0	8.0	11.0	15.0
LOSSES								
Petroleum Products Own Consumption/Loss		3.5	3.6	4.0	4.4	5.8	6.8	7.8
Oil Field Use/Loss		4.5	9.3	7.2	5.6	2.1	1.5	0.8
Gas Trunk Line Loss (Gas)	(3)	7.6	10.0	10.0	9.0	4.0	2.0	3.0

(1) Power for crude oil gathering and synthetic crude, product and trunk line oil transportation.
(2) Fuel requirements for crude oil gathering systems and trunk line oil transportation.
(3) Removal Permit related 1970 - 1990. In-province requirements only 1995 - 2000.
(4) Includes Loss.
(5) Removal Permit related.

TABLE VIII

ALBERTA
ENERGY CONSUMPTION
BY FUEL SOURCE AND NATURAL UNITS

	1970	1975	1980	1985	1990	1995	2000
Oil (MB/D)							
Demand							
Residential/Comm.	10.4	12.0	14.0	15.2	16.1	18.5	20.9
Transportation	55.3	65.8	72.2	83.0	98.1	121.6	152.1
Industrial	13.2	22.6	25.9	29.0	33.2	39.0	46.3
Thermal Generation	1.3	1.4	1.4	1.4	-	-	-
Losses	3.8	6.1	5.3	4.7	3.7	3.9	4.0
Total	84.0	107.9	118.8	133.3	151.1	183.0	223.3
Refinery Supply (MB/D)							
Crude & Equivalent	113.0	233.0	271.0	315.0	373.0	453.0	554.0
Refinery Gain	-	5.0	6.0	7.0	8.0	9.0	11.0
Total	113.0	238.0	277.0	322.0	381.0	462.0	565.0
Natural Gas (Bcf)							
Residential/Comm.	113.4	153.7	197.8	258.6	342.6	445.9	581.0
Transportation	12.0	34.5	24.5	23.0	18.0	8.0	10.0
Industrial	100.4	150.1	221.7	271.8	377.9	526.4	754.1
Thermal Generation	50.2	61.4	73.8	60.6	54.2	31.7	24.9
Losses	7.6	10.0	10.0	6.5	4.0	2.0	3.0
Total	283.6	399.7	527.8	620.5	796.7	1014.0	1373.0
Coal ($\bar{M}$ short tons)							
Residential/Comm.	.4	.2	.1	.1	.1	.1	.1
Industrial	.2	.3	.3	.5	.7	1.5	2.4
Thermal Generation	3.0	5.5	6.8	10.7	17.6	25.7	35.9
Total	3.6	6.0	7.2	11.3	18.4	27.3	38.4
Electricity (GWH)							
Residential/Comm.	4,020	5,770	8,260	11,640	16,180	22,270	30,510
Transportation	290	1,380	1,320	2,640	4,660	4,400	4,920
Industrial	4,340	7,180	8,410	9,550	12,930	18,290	25,530
Transmission Loss	1,170	1,730	2,200	2,870	4,130	5,450	7,420
Total	9,820	16,060	20,190	26,700	37,900	50,410	68,380

CONVERSION UNITS

Oil	1 Barrel = 5.85 $\bar{M}$ BTU's (Crude Oil Equivalent)
Natural Gas	1 cubic foot = 1,000 BTU's
Coal	1 short ton = 17.2 $\bar{M}$ BTU's
Electricity	1 GWH = 1 $\bar{M}$ KWH = 3412 $\bar{M}$ BTU's.

GROWTH AND % DISTRIBUTION OF ALBERTA OUTPUT BY INDUSTRY 1949 - 1970

INDUSTRY	Average Annual Change (%) 1949-1970	% Distribution of Output 1949	1970
1) Mining	9.7	7.2	15.4
2) Manufacturing	7.5	8.9	11.7
3) Utilities	10.8	1.1	2.7
4) Agriculture	1.6	18.0	8.3
5) Forestry, Fishing and Trapping	-1.2	.6	.2
6) Construction	5.8	8.0	7.3
7) Transportation, Communications	6.0	10.8	10.7
8) Trade	6.5	12.4	13.1
9) Finance	5.1	11.0	8.7
10) Community & Business Services	6.5	14.8	16.1
11) Public Administration & Defence	3.7	7.2	5.7
12) Real Domestic Product	6.1	100.0	100.0
SUB-TOTALS			
13) Goods Producing Less Agriculture (1 + 2 + 3 + 5 + 6)	7.9	25.8	37.3
14) Service Producing (7 + 8 + 9 + 10 + 11)	5.8	56.2	54.3
15) Industrial Production (1 + 2 + 3)	8.8	17.2	29.8

TABLE X

ALBERTA
ECONOMIC INDICES
1970-2000

(1) / (2)	1970 / 70/50	1975 / 75/70	1980 / 80/75	1985 / 85/80	1990 / 90/85	1995 / 95/90	2000 / 2000/95
Real Domestic Product	(1) 126	186	236	303	411	563	772
	(2) (6.1)	(8.1)	(4.9)	(5.1)	(6.3)	(6.5)	(6.5)
Goods Producing Less Agriculture	(1) 47	81	99	123	174	249	356
	(2) (7.9)	(11.4)	(4.1)	(4.4)	(7.1)	(7.4)	(7.4)
Service Producing	(1) 69	93	124	165	221	296	397
	(2) (5.8)	(6.2)	(5.9)	(5.9)	(6.0)	(6.0)	(6.0)
Industrial Production	(1) 38	66	80	98	140	205	297
	(2) (8.8)	(11.7)	(3.9)	(4.2)	(7.4)	(7.9)	(7.7)

(1) Relative value in indicated year.

(2) (% Growth rate over indicated period)